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ABSTRACT

This qualitative study examined constructs of "expertise" in the domain of music with five groups of handbell choirs, four of which were comprised of individuals with mental retardation or developmental disability. Subjects with mental retardation also differed in their residential placements (home, community, institutions) and level of developmental disability. Information was obtained from direct observation, videotapes, interviews with choir directors, and a stimulated recall procedure. Results are analyzed in terms of the "central phenomenon" (the bell ringing event) and a model of "socially shared expertise" comprised of causal conditions, intervening variables, strategies, and consequences. Discussion centers on definitions of expertise, expertise as socially shared cognition, distributing the cognitive load through the group, situated practice, and scaffolding. The paper concludes that the groups with mental retardation differed from the control group in the amount of cognitive load assumed by the director, in the amount of self-monitoring versus other-directed monitoring, in the amount of attention given to the director's cues, and in planning by directors. (Contains 95 references.) (DB)

Skilled Performance In Individuals With Developmental Disabilities

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**Paper Presented at the Annual Meeting of the American
Association on Mental Retardation
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- C: We're the ones that, you know, that [are] doing the, uh, the music.
 L: Oh really?
 C: Really. It's really the handbells that is making the music really.
 L: It's really the handbells making the music.
 C: Yeah, it's making the, uh, you know. It's the piano, and it's the bells, and it's Evelyn [the director] mostly.
 L: And it's Evelyn mostly.
 C: She's helping like, if it wan't, if it wasn't for the bells, handbells, we wouldn't really, we wouldn't have the, we wouldn't really be able to have, you know, what's the use of Evelyn coming out if we didn't have to, we have Evelyn's job, it's clients, it's people, there's clients out here, the school you know, and Evelyn come out and help us with handbells which...
 L: Well, what did you mean when you said, um, it's the music and the piano and Evelyn mostly?
 C: Well it's well it's all the music. The piano and the handbells and Evelyn. We're all bonding in, you know, we're all working together.

(Interview with Chuck, handbell ringer with mental retardation, November 3, 1992).

Research on learning in individuals with mental retardation has highlighted learning deficits in this population in a number of crucial areas. Memory research in the 1960's and early 1970's highlighted differences in short-term memory (Ellis 1963, 1970); input organization (Belmont & Butterfield, 1971; Spitz, 1966); retrieval of stored information (Spitz, 1972, 1973); attention (Zeaman & House, 1963; Fisher & Zeaman, 1973); and oddity learning (Brown, 1970; Hall, 1971; Martin & Tyrrell, 1971) in individuals with mental retardation. Later investigations focused on higher-order cognitive processes, in particular, on rehearsal strategies (Belmont & Butterfield, 1971; Butterfield, Wambold, & Belmont, 1973); executive control (Brown, Campione, & Barclay, 1971); transfer (Belmont, Butterfield, & Ferretti, 1982; Borkowski & Cavanaugh, 1979; Brown & Campione, 1984) and motivation (Borkowski & Kurtz, 1987; Haywood & Switzky, 1986). Most recently, research has pinpointed social skills (Foxy & Faw, 1992; Greenspan & Granfield, 1992; Gresham & Elliott, 1987), and self management (Hughes & Peterson, 1989; McCurdy & Shapiro, 1992) as being different in people with mental retardation. With very few exceptions, the overwhelming focus of investigations in the cognitive paradigm has been on the learning deficiencies of these individuals.

By contrast, a major theme in research in learning of those without mental retardation is that of expertise. Expertise is generally defined as superior knowledge and skill within a specific domain (e.g., Chase & Simon, 1973; Chi, Feltovich & Glaser, 1981; Chi, Glaser & Rees, 1982; Ericsson & Smith, 1991; Eysenck & Keane, 1990; Glaser & Chi, 1988). Investigations of expertise have traditionally focused on the characteristics of individuals who are experts. Expertise research is predominantly guided by the cognitive science paradigm, which views learning as a form of problem solving. In this paradigm, cognition is seen as a phenomenon that occurs within an individual and is notably non-social. Glaser and Chi (1988) summarized the findings of investigations on the traditionally accepted notion of expertise and proposed that the critical difference between experts and novices lies in "the expert's possession of an organized body of conceptual and procedural knowledge that can be readily accessed and used with superior monitoring and self-regulation skills" (1988, xxi).

The cognitive deficits consistently associated with mental retardation (e.g., attention and self-monitoring skills) seem initially to preclude the possibility that an individual with mental retardation could be classified as an expert. Yet individuals with mental retardation do occasionally display high-level skill in some areas such as music or computation (e.g., Ericsson & Faivre, 1988; Müller, 1987, 1991a). It should be noted that expertise is a construct that refers to superior performance in a specified domain: it is not contingent upon any sort of requisite level of *general* intellectual functioning, which is part of what is considered deficient in people with mental retardation. In fact, several studies (Ceci & Liker, 1986; Schneider, Körkel, & Weinert, 1989; Walker, 1987) have

demonstrated that domain-specific expertise may compensate for low overall aptitude level. There are no existing studies, however, that have examined whether a high level of domain-specific knowledge could compensate for the depressed cognitive functioning observed in individuals with mental retardation. Again, given the cognitive attributes of this population it does seem unlikely that people with mental retardation could be classified as expert. However, the construct of expertise or even domain knowledge, however, has not been previously explored in people with mental retardation (Campione, 1987; Ferretti, 1989; Ferretti & Cavalier, 1991; McFarland & Wiebe, 1987). A primary difficulty in conducting such research, given the limited areas in which those with mental retardation demonstrate success, lies in identifying a domain in which they display some amount of high-level skill.

Musical Expertise and Mental Retardation

Traditional domains chosen for studies of expertise, for example, chess and physics, are not ones in which persons with mental retardation exhibit high-level skill or even competency. Savant behaviors demonstrated by people with mental retardation tend to be highly idiosyncratic with regard to the area in which the skill is exhibited (e.g., calendar calculation) and are demonstrated on rote tasks rather than in complex domains. However, a domain in which historically (see Miller, 1989; Treffert, 1989) and empirically (e.g., Miller 1991a, Miller, 1991b; Sloboda, 1991; Sloboda, Hermelin, & O'Connor, 1985) individuals with mental retardation have demonstrated ability is that of music.

Miller (1990, 1991a, 1991b) has comprehensively investigated musical ability in individuals with mental retardation, both in a series of empirical studies and from case histories of reports of people with savant musical skills. His research has pointed out that these individuals can demonstrate absolute pitch, awareness of the rules and structures of music, and memory for longer temporal patterns. His results suggest that the short-term memory of musical savants is comparable to the exceptional memory shown by experts in other domains in terms of its speed, efficiency, and incorporation into a complex knowledge system. These results suggest that music is a domain in which individuals with mental retardation might exhibit competence or expertise.

Expertise and Music Performance

Research on music performance is somewhat limited: The majority of investigations have examined perceptual acuity in musicians, rather than performance within musical contexts (Sloboda, 1988). However, Sloboda in his book *Generative Processes in Music* (1985) laid out the following principles of expert musical performance in individuals: (a) knowledge of large-scale groupings or patterns within the music that control performance; (b) highly flexible procedures for solving local problems in performing a musical piece, with these procedures often operating without the need for conscious monitoring; and (c) the ability to self-monitor performance and to take corrective action.

While expertise is manifested differently from domain to domain, these principles do seem to overlap with studies of expert behavior in non-musical domains. The structural patterns that expert musical performers recognize is similar to findings that experts in other domains perceive problems at a deep, rather than surface level. The flexible, automatized routines these performers have are similarly analogous to the highly automatic, seemingly non-conscious behavior observed by experts in other domains. In contrast to this automatized cognition, the novice musical performer focuses on superficial aspects of the music, on managing local problems, and displays a lower ability to monitor his or her own performance. An example would be the novice piano player who focuses on how to play the particular note values within a bar of music, instead of realizing that this pattern has previously appeared earlier in the piece. Finally, the high levels of self-monitoring found in music performers can also be found in experts in other fields. Other characteristics of expert performance, such as superior memory within a domain or time spent analyzing a problem, have not been found. However, I believe this might be due to a shortage of existing research on expert music performance rather than to qualitative differences in music performers.

Performance of Skill in the Participant Groups

The participants in this study were part of handbell choirs. Handbells are the fastest growing medium of music performance in the field of special education (Schulmerich Carillons, Inc., 1990). Currently, there are more than seventy-five handbell choirs for people with mental retardation in the United States (Pinson, 1993). Producing music from handbells is similar to performing music on other instruments in that it involves the outward manifestation of a skill and is constrained by conventional music forms such as tempo and structure. It differs from the performance of other musical instruments in that handbells are always played in a group situation. In the groups I was observing, it was not clear that the individual participants were the appropriate unit of analysis. The performance of handbell skill thus differed from skill examined in previous studies on expertise in that the focus in handbell performance was on the skill exhibited by a group rather than that demonstrated by a particular individual.

Definitions of Expertise

Alexander and Judy (1988) have remarked on the looseness of the terminology use in the expert/novice literature with regards to level of competence. Often, it is not clear how subjects are defined as being novices or experts in a given research study. Methods used to classify subjects include: outcome performance (e.g., Ceci & Liker, 1986); frequency of activity (e.g., Means & Voss, 1985); job capacity (e.g., Gentner, 1988; Borko & Livingston, 1989); length of time and membership in an organization (e.g., Tanaka & Taylor, 1991); professional degree (Dawson, Zeitz, & Wright, 1989); and test achievement (Schneider, et al., 1989; Walker, 1987). Other studies (e.g., Leinhardt, 1987) do not describe the selection of their subjects to any extent at all. This diversity by which experts are classified as being experts and novices labeled novices clouds the concept of what we refer to when we use the term expertise (Alexander & Judy, 1988).

The issue of whether the groups in this study could be definitely classified as expert forced me to simultaneously examine the construct of expertise along with my examination of the groups. I had tentatively classified the groups as expert in order to explore the nature of expertise in these groups, but there was no quantifiable measure such as used in chess (see Charness, 1991; Simon and Chase, 1973 for descriptions) to use in order to rate the groups as more or less expert. Expert-novice studies tend to distinguish skill level using a comparative distinction (Salthouse, 1991) in order to classify skill level. But then, the question was to whom should I compare these groups? To other groups with mental retardation? To groups without mental retardation? If expertise was indeed a purely cognitive phenomenon, *why was it necessary that social comparisons be made to establish the groups as expert at all?*

From the viewpoint of the audience, these groups did seem to possess special skill. The groups were invited to various organizations to perform, were applauded enthusiastically, and occasionally received financial compensation from their audiences, however I was not sure if such positive social perception was sufficient to call the groups expert. As I continued my investigation, I became increasingly aware of the social nature of classifying the groups as expert; the social perception and consensus involved in classifying the groups as expert and the social consensus necessary to classify as expert in a given domain. The cognitive and the social became intimately intertwined in my investigation and thus in my subsequent analysis of performance in these groups.

Method

In the last twenty years, a small but growing number of researchers in education and related disciplines have been using qualitative research methods (Stainback & Stainback, 1988). Part of the utility of these procedures lies in understanding more fully the environment surrounding individuals with developmental disabilities. In addition, such an approach has been suggested by investigators (Jacob, 1990; Skrtic, 1986) in the field of special education as an appropriate alternate framework for conceptualizing current issues in the field. Skrtic (1986) in particular has criticized positivist models in research as inherently value-laden in their approach to developmental disabilities as types of pathological conditions.

In accordance with suggestions from Lincoln and Guba (1985) credibility of the findings from this qualitative study was established through several methods: (a) triangulation of the data, wherein several methods, namely stimulated recall procedures, interviews, observations, self-participation in the activities and informal conversations, were used in collecting the data and multiple sources, namely directors, handbell ringers, and other individuals associated with the groups, were used to construct the final model; (b) prolonged engagement with the groups participating in the study; (c) referential adequacy, wherein some portion of the data was not included in the original data analysis but reserved so that it might be compared with the resultant model; (d) negative case analysis where the emergent categories and relationships among them were tested to verify that they accounted for the data obtained; and (e) member checks, where the participants who could read were given back transcripts from the stimulated recall procedures and interviews, and the theoretical model for commentary and editing. Dependability was partially established by the above attempts at credibility, also by the informal monitoring of the analysis by a colleague and by the more formal monitoring of experts comprising the dissertation committee itself. Confirmability is indicated by the use of triangulation of the data. Transferability may be established by the reader from the thick description of the phenomenon and context that follows in the reporting of the results of this study.

Research Questions

In accordance with the suggestions of Strauss and Corbin (1990), initial research questions guided the data collection and analysis of the data for the larger study. These research questions were developed so that they would give sufficient flexibility and freedom to explore the skilled performance in individuals with developmental disabilities in depth. Two questions from the larger study will be examined for the purposes of this paper:

1. How might the construct of "expertise" be applied to demonstrations of skill and competencies in the domain of music by individuals with mental retardation?
2. In what ways was the expertise exhibited by individuals with mental retardation in the domain of music similar to or different from the manifestation of expertise in non-retarded populations?

Participants

The participants for this study were the directors of and the performers in five separate handbell choirs. The ringers in four of these handbell choirs were individuals who are labeled as being mentally retarded or developmentally disabled, whereas the performers in the fifth group consisted of individuals who were not disabled. The groups were selected for this study because they (a) had been in existence for at least five years, (b) performed publicly frequently and in response to invitations from organizations not connected to the group, and (c) had an established repertoire of music that they performed. The criteria of group membership, experience level, and a given level of performance (an established repertoire of music) in choosing groups that might be considered to be skilled were used. In addition, a selective sampling was used in that each of the directors of the five groups conducted his or her group differently. Finally, the groups of performers were selected because they differed with regard to their residential placements and levels of developmental disabilities.

Choir #1. Choir #1 was located in a large metropolitan city in California. It consisted of 19 adult performers with developmental disabilities, the majority of whom had Down Syndrome. Most of the performers in Choir #1 lived at home with their parents. The group practiced once a week in a community center for adults with developmental disabilities.

This group had been actively performing for five years at churches, community events and, recently, at a major league baseball game. During the Christmas season, they performed as often as five times a week, although at other times of the year they performed three to four times a month.

I spent from November 16th to the 24th with Group 1. I observed and videotaped three practices and three performances and observed the groups members and director daily at the center. I also stayed overnight at the center with several of the bell ringers before an early performance the next morning. I looked through the musical charts the groups used. I interviewed the director and two bell ringers over the process of learning the musical piece "Let It Snow!". These interviews resulted in three

hours of audio tapes from Elaine, and approximately 90 minutes of tape from each of the bell ringers, Tracy and Henry. Additionally, I interviewed the accompanist and seven other ringers in the group formally, and spoke with all of the ringers informally. Artifacts in the form of musical scores and programs were collected.

A modified stimulated recall procedure was used with the director and the two bell ringers after each practice and after the final performance. These procedures produced data in the form of audio tapes and my observational notes on their performance.

Choir #2. The performers in Choir #2 lived in a state school that maintains 700 clients in a large city in the southwestern United States. At the time of this study, there were seven members of this choir. Because of deinstitutionalization in the last several years, this choir had undergone considerable attrition and changes in its membership. Choir #2 had been in existence for more than 20 years, although most of the present members of the choir had been together for a little over five years.

Choir #2 played weekly at the chapel at the state school, three or four times a year at local churches, and at local community events. They had also, at the time of this study, been invited to perform at the opening of the city convention center that was attended by several thousand people.

I observed this group during the months of September to December. I videotaped and interviewed the director and group members over a period of five weeks in October and November, generating approximately ten hours of audio tape. I observed five practices and two performances during that time and visited five of the choir members in their homes during this time period, attended several church services and a Christmas program at the state school. I interviewed the director and two members of the choir during the process of learning "Hark the Herald Angels Sing" and we reviewed the videotapes of each practice in a modified stimulated recall procedure. I also watched several videotapes of practices with two additional members of the handbell choir.

Choir #3. Choir #3 consisted of eleven men who lived in a residential facility in a rural area south of a major metropolitan area in Texas. The music director, Patrick, also conducted the choir using direct cueing. However, some of the members of the Choir #3 held two bells during practices and Patrick cued several performers, or one performer with two bells, to play them simultaneously.

The choir performed at least twice a month in a chapel at the residence and each June at a musical festival on the grounds of the facility. They also performed for local church services, nursing homes, and area events three or four times a year.

I informally observed this group from September to December. I videotaped and interviewed the participants over a five week period in October and November as they practiced the piece, "Sweet Hour of Prayer". I videotaped and observed five practices and three performances. I observed members of the group during a two day trip I took with the choir to a town some 200 miles away from the area, and visited informally with several members of the choir in their group home. In addition, I substituted for a sick bell ringer in this choir during part of a practice.

Choir #4. Choir #4 was located in a small town in the southern United States, and, like Choir #1, was part of a community center for individuals with developmental disabilities. The choir consisted of 19 performers with a wide range of developmental disabilities. The choir was established thirteen years ago, and, although not all members had been in the choir for that length of time, a minority of the performers had remained in the group for the duration. Practices were twice a week at the community center, except for when the group is preparing for a performance, when the practices became daily.

The director, whom I will call Brian, had led the choir for the entire period of its existence. Brian used a method developed by Cannella (1976), known as the Kodaly method, in which a certain hand position is used to indicate each scale tone. His use of the Kodaly method was sufficiently sophisticated so that the group could play pieces containing as many as four octaves and 79 chordal textures.

Choir #4 performed extensively. During the year they performed two or three times a month at churches, community events and at the request of social organizations. In November and December, performances were particularly frequent. During one holiday season, they performed at the United

States White House where one observer commented, "I didn't know any of those people had handicaps!"

I visited this group briefly for two days at the end of October, and then from December 13th to the 19th. I videotaped and observed three practices of what Brian calls his "A" choir, and two practices of the "B" choir. The "A" choir practiced "The First Noel" over the three days I observed and I interviewed Brian and three participants over the course of learning the piece. I rode the bus home with the majority of the bell ringers each day, ate lunch with them in the cafeteria and visited with them during the day at the center. Brian is the music director for nine other schools in the district. I traveled with him to several schools where he was preparing newly formed handbell and chime choirs for upcoming Christmas performances and attended two of these performances.

Choir #5. Choir #5 consisted of performers who were not mentally retarded. The choir was located in the same metropolitan city as was Choir #2 and was one of three handbell choirs in a large church. Group #5 performed at least monthly for church services, although during the Christmas season they often performed at other churches.

I observed this group from September to October and observed five practices and two performances. I followed two bell ringers and Sam over a four week period as they practiced the piece "Regal Procession". I interviewed eight members of this choir, accompanied them when they socialized after practice, and had many informal conversations with both Sam and the choir members.

Procedure

The data gathering took place between September of 1992 and January of 1992. Several methods were used to obtain qualitative data in this study: interviews, a stimulated recall procedure, observations, and a participant-observer stance. Information was obtained from direct observation, videotapes and from stimulated recall procedures. Each director was asked to inform me of an upcoming performance that would occur during the data collection period. I then observed, from the initial practice to the final performance, each group's rehearsal of a new piece of music for the upcoming performance. The amount of time each group was observed therefore varied. However, the range of practices observed was between a total of two and six. In addition, data included my own experiences as a novice handbell ringer and a diary focusing on my experiences at weekly rehearsals and occasional performances.

Interviews

An initial interview was conducted with each director before observations of the practices began. An additional interview was conducted after the director had chosen a piece of music that the group would perform for its upcoming performance.

All interviews with the directors were tape recorded and transcribed. In addition, each director was asked to watch a videotape as soon as possible after each practice and the final performance using a modified stimulated recall procedure. In this modified procedure, I found that if I responded to the directors and participants as they made comments, they were much more verbal and went into more detail about what was happening in each group. I began conducting these interviews in this more relaxed fashion after the first week of data collection. The directors were asked to verbalize their reactions to what they observed on the videotape and to comment on their interactions with the performers. The directors were encouraged to make any additional comments about the practice or performance. Again, these comments were tape recorded and transcribed.

This same modified simulated recall procedure was also used with at least two members of each handbell choir following each practice. At least two of the same members of each choir were interviewed after each of the practices. These members were selected by the directors as individuals who (a) had sufficient verbal ability to discuss their performance, (b) were amenable to an interview, (c) had several years of experience as a member in the handbell choir, and (d) exhibited what the director believes is a "high level of skill" in performing in the choir. In a pilot testing of the stimulated recall procedure with individuals with developmental disabilities in Group 3, I found that some participants were able to give only very limited responses while viewing videotapes. Therefore,

depending on the verbal ability of some of the performers and their ability to participate in the stimulated recall procedure, a list of questions was used to supplement the viewing of the videotape of the practice or performance.

The interviews were tape recorded and transcribed for all of the ringers in Groups 1, 3, and 5. Groups 2 and 4 were used to code the data selectively, in that the data were analyzed with respect to the categories that emerged from the analysis of the data from Groups 1, 3, and 5, and were only partially transcribed. However, all of the tapes were reviewed orally and relevant categories were recorded on three-by-five cards.

Observations

An initial observation took place to pilot the data collection procedures, to acclimate the participants to my presence, and to familiarize myself with the environmental context. I also directly observed the practices in preparation for the final performance and the performance itself in Groups 1, 2, 3, and 5. These observations were compiled, along with a review of the videotapes of the practices and performances, into a single observational transcript of each session. In these transcripts, I included both a narrative recounting of what occurred during the sessions and commentaries on what interactions and behaviors that occurred in each group. Many of the audio tapes were partially contextualized by the sound of the videotape being reviewed in the background. When comments were obscure or unclear, videotapes were reviewed along with the audio tapes.

Observing Handbell Performance. Handbell performance is readily observable. Each performer must play his or her bell in an obvious and definite manner in order to produce a chime. In addition, the nature of handbell ringing is procedurally rich. There are a series of discrete responses each player must make in each musical piece and a series of motor responses he or she must make to elicit sound from the bell. It also relies more on gross motor, rather than on fine motor skills because the necessary action for playing the bell comes from the arm and wrist, rather than from the fingers. Individuals with limited fine motor capabilities, such as is often demonstrated by individuals with developmental disabilities, can more readily produce sound from a handbell, as opposed to, for example, a guitar or piano, which depend on finger dexterity.

In order to ring a bell correctly, a ringer must have a requisite extent of procedural knowledge because there are at least as many ways to ring a bell incorrectly as there are to ring one correctly. The bell must be held by its handle, because any contact with the bell surface will distort or muffle the sound of a ring. The bell must be turned in the correct direction so that the clapper fully strikes the side of the bell. Sound is usually produced by using a long, downward swing that culminates in a slight flick of the wrist that propels the clapper to strike the side of the bell. After striking a note, the bell must be maintained in an upward position so that the sound of the note travels outwardly from the sides of the bell. Lowering the bell or turning it after a ring again distorts the sound. After the full value of the note the bell has rung has been reached, the bell is then lifted so that the clapper may fall back into its original position. The task of ringing in synchrony with other ringers is difficult in that while performing, handbell ringers have a limited ability to hear the other ringers in the group. The director is then responsible for pulling the different rings that are occurring into a synthetic whole.

The majority of choirs ring from two to five octaves, with the majority of them ringing three octaves. Depending on the number of individuals in a choir, a single bell ringer may ring anywhere from one to more than fifteen bells. With additional bells, the task for a ringer usually becomes more complicated because he or she must then anticipate the change of the bells in their hands so that the circular downward motion may be begun that is required to make a bell ring.

Analysis

All practices and performances were videotaped. Reviews of the tapes were compiled with observational notes made during the session. In order to analyze the data, I used coding procedures described in Strauss and Corbin (1990) and comparative analysis (Glaser & Strauss, 1967). In comparative analysis, data are constantly compared and analyzed, which allowing the investigator to identify conceptual categories and to develop a theoretical explanation to explain the phenomena that

are being observed. In addition, comparative analysis may be used to verify theory, either theory that has emerged from the data or existing theory. In this study, comparative analysis was used both to verify the theory that was developed over the course of the investigation, and to test the existing theory of expertise. As part of attempting to generate a theoretical model from the data, data collection, coding, and analysis were intermingled.

All interview and observational transcripts were analyzed using open coding. As part of this process, the data were examined, compared, conceptualized and categorized (Strauss & Corbin, 1990). The interview transcripts were initially analyzed using a line-by-line analysis, wherein coding was thickly and consistently applied to the transcripts, although, as categories emerged from the data, I chose to focus on only those themes in my later analyses. Observational transcripts were analyzed as entire documents.

Observations, transcripts, field notes, results from the stimulated recalls, and interviews were initially analyzed separately for Choirs 1, 3, and 5. Conceptual labels were formed from each transcript and tallied. Concepts were then grouped together to form tentative categories. The emerging categories were hierarchical, abstracted units that contained subcategories resulting from the open coding. These categories later became conceptual units of the emerging theory. A decision was made on which of the emerging phenomena had the richest source of properties, or characteristics. At this point, analysis was focused on one central phenomenon. After completing open coding on Groups 1, 3, and 5, I confirmed the emergent categories with the data from Groups 2 and 4. The decision to code data selectively from Groups 2 and 4 was made because of the richness of the categories that had emerged from the analysis of the data at that point and as a method of increasing the credibility of the analysis.

Axial coding, wherein connections between categories were made, followed open coding. Following the paradigm model suggested by Strauss and Corbin (1990), categories established in open coding were identified as denoting the phenomenon, causes/conditions, contexts, action/interaction strategies, intervening conditions or consequences of the phenomenon. The phenomenon refers to the central idea or event around which the categories that have emerged from open coding are organized. Causal conditions are those events or incidents that lead to the occurrence or development of the phenomenon. The context represents both the specific set of properties, or characteristics of the phenomenon and the particular set of conditions within which the action/interaction strategies are taken. These action/interaction strategies are evolving, purposeful, and goal oriented in nature and are enacted in response to or in order to manage the phenomenon of interest. Finally, the intervening conditions are those conditions that facilitate or constrain the action/interactional strategies taken within a specific context.

Selective coding was used to relate the core phenomena to the other categories that emerged from the data and to validate these relationships. Selective coding is similar to the previously described axial coding but is done at a higher level of analysis. The core category was developed in terms of its properties and its dimensional range and other categories were related to this core category. The story line was then formulated analytically. For the purposes of this paper, only the parts of the case studies and the analysis of the action/interaction strategies that related to the skill exhibited by the groups will be discussed.

Results

In discussing the results of this study, I will focus on Group 4, which is only one of the five cases that were part of the study, however the results and the following discussion is based on the results from all of the cases. The key participants (the director and two handbell ringers in the group) will be described and these sections will be followed by a description of the group as a whole. All quotes will be direct transcriptions reflecting the natural pauses and punctuation that occur in verbal language, and will not necessarily be grammatically correct. After these descriptions, I will then discuss the central phenomenon and the analytical storyline of my observations of the handbell choir.

Group 4

Choir 4 consisted of 19 men and women with developmental disabilities and their director, Brian. Three of the members of the choir had visual impairments and three others had physical impairments that necessitated the use of a wheelchair. The group practiced every Monday and Wednesday afternoon for one hour, and on alternating Fridays. During practices, the members of Group 4 were rather quiet and approached their task with solemnity. Brian, the director of the group, consistently treated the ringers in a respectful, yet calmly authoritative manner. Molly, one of the ringers, commented, "And he's very professional, like, uh, keeping us in, in concentration on our song, he's very professional at that..." (Interview, December 18, 1992). The serious demeanor changed abruptly the moment practice was over and the ringers boarded their afternoon bus. The ringers then engaged in jokes and conversations while riding home together.

Group 4 had performed frequently in the years previous to my observations. Locally, they performed at festivals, schools, and for organizations. They also had been invited to perform at the annual convention of the American Guild of English Handbell Ringers, the White House for the annual Christmas open house, and with Al Hurt, the jazz musician.

The group began 13 years ago with Brian as the director. Five of the members of the original group were still ringing with the group. The handbell choirs were very popular with the clients at the center and with their parents. Clients who were higher functioning usually requested to join the choir on their own, whereas the parents of lower functioning individuals requested admission for their children. The group at one time grew to contain 29 members. In order to keep those who were in the group playing as much as possible, Brian decided at that time to divide the group into an "A" and a "B" group.

The "A" group, that was the focus of this study, played almost four octaves of bells. Some of the more experienced members could play four bells in a given piece. Two of the ringers had physical limitations that restricted them to using only one bell. The majority of the ringers played two bells, however. The number of bells assigned to each ringer was determined by Brian.

Practices for Group 4 began at 3:00 each day. Usually Kay, an employee at the center, and several of the ringers began setting up the tables, foam rubber, and bells before the hour. When Brian arrived, he oversaw the placement of the bells and set up a stand in front of the tables. The tables were arranged horizontally along a long wall in the center's cafeteria. The ringers who were ambulatory stood behind the tables in a row, while those in wheelchairs sat on the right-hand side of the tables.

Equipment customized designed by volunteers at the center allowed the ringers with more involved physical impairments to participate in the choir. Three ringers who were in wheelchairs and who were unable to ring the bells manually sat in front of three switches connected to bells in front of them. These bells were encased in a wood casing with a wire that led from the frame to the switch. When given a cue, these ringers responded by pressing a switch, causing the bell to ring in its casing. Brian also had a foot switch that was part of a small platform he stood upon. When he pressed the switch, a signal was sent that activated stimulators on the legs of the ringers with visual impairments. When these ringers received a stimulus, they rang their bells in synchrony with the vibrations they felt and distinguished among multiple bells according to where on their legs the stimulators vibrated. In addition, volunteers at the center designed a chime-pulling device that enabled a visually and hearing impaired ringer to play eight sets of chimes by responding to vibrations sent from a computer that was programmed with the music.

The ringers usually stood in the same place and responded to a given hand signal that Brian made. The hand signals, which were designated with the syllable names of; Do, Di, Re, Ri, Me, Fa, Fi, So, Si, La, Li, and Ti, represented the chromatic scale. Each of these signs were given with Brian's right hand. Where he placed his hand in relation to his body denoted one of the three different octaves that play. For example, Brian could signal "Low Do, High Do, Double High Do" and each time "Do" would be played by three different bells that represented the same three notes, but in three separate octaves. Usually "Do" represented the note "E" in Brian's system, and the group played in the key of E because those are the bells that the group were initially able to buy. Brian avoided giving a bell with a particular letter consistently to certain ringers because this meant that the group could more

easily play a piece in a different key, which was usually the case when they accompanied a singer. He then needed only to switch his direction to play in the different key. Thus, whereas the bell might change, the ringers usually responded to the same hand signal. Brian paired these single notes with the number of the chords, I, II, III, IV, V, VII, and VII on his left hand. He moved his left hand sideways, down, up, or away from his body to distinguish whether these chords were major or minor, and to distinguish between the octaves the chord was played in. Thus, there are 150 different chord symbols he could use. In the song, "Chestnuts Roasting on an Open Fire" alone, he signaled 72 different choral textures that had to be learned by the ringers.

For some ringers, Brian may use other cues, in addition to hand signals to aid the ringers in playing their bells:

B: I've had some that know their parts but they're like, "Mr. Brian give me some kind of sign other than the signal that you're giving me that it's ok to ring." What I do in those cases is I'll pair eye contact, and I'll tell them, "When I look at you and you see your hand signal..." and then I'll fade the eye contact as they become more confident ringers (December 15, 1992).

Brian thus provided additional scaffolding for those ringers who were beginners. Much of this scaffolding, however, seemed to take place before a practice began. He gave newer ringers fewer bells and bells that did not play as frequently so that cognitively they had less to monitor when learning how to ring.

Brian did not have the ringers play all the way through a new piece. He began at the beginning and taught them the hand signals they would be responding to on the piece. The ringers played consistently on a given melody (right hand) signal, and tended to play on a given chord, but this depended on the song and the key in which it was played. Brian might ask a ringer not to play their bell in response to a given cue, especially when he wished to give a part of the piece a slightly different flavor. This meant that the ringers had to be able to remember which chords in what parts of the piece they played.

Brian found that the choir members were able to memorize fairly easily the large variety of chords as well as their own notes:

B: What happens it, once I taught it, and then it may have taken them three or four songs of constant reminders I found that once, maybe, I'm saying three or four songs as a average, it may have been two for some, one for some, it may have been five and six for others, it became automatic. It wasn't something, and to my amazement, lots of times it was generalized, even with those, those, uh, people who were considered, who were classified severe and profound, lots of times. And I don't know what all of the variables is, but just on outward observation I have a clue that they learn to tunnel in to the piece, so much so that it gives them, uh, an advantage that maybe they didn't have before (Interview, December 18, 1992).

Brian's observation that the members of the group were able to apply knowledge of chords learned in one piece to another piece was interesting given the difficulty that individuals with mental retardation usually display in transferring learning. This transfer made learning a new piece a short process. The present group of ringers, that included several ringers who were relatively new (less than five months of experience) was able to learn a piece in approximately five practices. I would estimate the total continuous practice time needed as being about three hours.

Brian, like the other directors, believed that practice was necessary, but the function that it played in preparing a piece was not clear to me at first:

L: ...I guess I'm kind of confused with the idea of what part practice plays in your technique because we're usually talking about identifying chords, identifying signs, and if they know how to do that, what more do they need to know. What...I mean what more needs to be practiced?

B: Well, see what they know is, in a general basis, I have to be there to make sure in the rehearsals that we get the little specific type things....And then, to get the style down, they need to see my, because I'm developing a style for ringing this and directing it. It's new for me

too. So a lot of times what happens is my hand signals improve and my generation of those hand signals of those particular pieces improve. Their performance improves....

L: So, it's not only them practicing, it's you.

B: Right. 'Cause I'll, I'll look at it and it's like, it's all of us together. We form, we form the instrument together (Interview, December 18, 1992).

It seemed that Brian, as well as the ringers, needed several practices to learn a piece. Once he became more competent in directing the piece, the ringers could then become more skilled in playing the piece. The group and the director came together to produce the musical output. Brian's reference to "the instrument" seemed to reflect that sound was produced not only from the bell, but also from the person who rang the bell, the person's responses to Brian's cues, and Brian's ability to give the cues.

Brian, Handbell Director

Brian had his Bachelor's degree in music and is a registered Music Therapist. He traveled and played music for several years after receiving his first degree, occasionally playing in jazz bands. He also played piano and several other instruments. Brian had been with the choir as its director for the entire 13 years it had been functioning. He also served as the music therapist for nine different schools and spends much of his day traveling from school to school. His duties at the center, where the handbell choir practices, began at 7:00 in the morning when Brian drove a microbus to pick up students and clients and transported them to the center. He also was responsible for bringing the clients home after handbell practice, most times returning to the center after 5:15 each day. Despite his grueling schedule, Brian advocated for scheduling public performances so that the group could demonstrate their abilities, although this entailed additional labor on his part.

Brian had selected which choir members would be placed in the "A" group or in the "B" group using several criteria:

B: I take it on an individual basis. A child, or a student, or a client coming in, I may feel like they have enough emotional stability and enough intellectual capabilities to play initially in the "A" group. Sometimes that happens, rarely. Most of the times we start people in the "B" group and then graduate to the "A" group.

L: How would you know that somebody was at a level that they could go right into the "A" group, I mean what kinds of things would you look for?

B: I look for, uh, responsibility in their day-to-day task here at the center. I look for, uh, an even tempered person, ok? And I look for people who have an eagerness to participate. Usually that combination is almost undeniably going to be a good functioning member. There has been some exceptions, but for the most part, that's a pretty good gauge.

L: Now, you said that if they had the intellectual abilities...do you mean that they're, and when you said...

B: Well, maybe I should clarify that to say that they have the attention span necessary. Uh, I take them no matter what their intellectual abilities are. I've had, I've had some that were, that only range once in maybe a whole performance but, if we could get that then we're happy with that. I don't exclude anybody on that note. I do, however, in the "A" group, it is a prerequisite, of course, to have a certain behavioral, appropriate behavior level. The "B" group, no. The "B" group I'll take people who, and we use the, the bell ringing experiences as a catalyst for better behavior, as a behavior modification tool. So, uh, the impetus for a "B" group was good, 'cause now we have a mixture and it's not as, it's not as an abrupt thing for a person...(Stimulated recall, December 15, 1992).

Brian repeatedly mentioned that he taught skills within the context of a piece. He then practiced a song until the piece had become "almost" automatic for the group members, in that the ringers did not have to concentrate on the physical ringing of the bell. I asked:

L: So the part that they are still having to consider, the part that's not automatic during the performance, what would that be?

B: The part that they have to keep together is how many times they need to play, at what points they need to play, and are they playing with the rest of the choir...are they coming in when my hand hits the downbeat. Those kinds of things still give them the challenge of the musicianship required. The other things, much like when you play an instrument, uh, you, when you play a violin, initially you have to think about how the bow is sitting on the string and what angle, but as those things become innate and as you learn to play the instrument then you no longer think of those things (December 18, 1992).

Brian was referring to the automaticity needed by a ringer to play a bell. He saw the physical movement needed to produce sound as being the part of handbell ringing that eventually became automatic in the ringers. The timing of a ring and the reading of his cues were what he felt should be the eventual focus of the ringers once these movements were automatized.

When new members entered the group, Brian had the new member practice alongside of the other ringers. He gave the new ringer additional instructions, but had him learn his or her signals while the group practiced their usual pieces. Brian used the analogy of a team to describe how his group worked together and practiced:

B: ...and also another consideration that we would take into effect would be new members, which I have a bunch of right now. And, uh, the old members have to go through the same plays as the new members. Just like a football team goes through, when someone new comes on board, they have to go through all those plays even though they know 'em in inside and out. For the most part, they still have to go through them for the benefit of the new players. So that the new players can be familiar with the whole process. It is a group playing together, so one person coming in changes the whole complexion of the group (Interview, December, 18, 1992).

Playing a piece then did not seem to be dependent on only the skills of the experienced ringers, but also on how those skills meshed with those of the new ringers. The output of the group was not solely dependent on individual performance, but on the performance of the group as a whole. New members were able to model from more experienced ringers and continuously participated alongside of them while ringing.

Brian talked quite a bit about learning the chords in a piece of music. During my observations of the practices of "The First Noel," I found that his instructions initially focused on the ringers playing their bells in response to the appropriate hand signals. After several practices of a piece, Brian would then begin to focus on the ringers playing simultaneously on chords. Finally, he began to change the tempo of the piece. He did not refer often to the physical movements necessary to produce music from the bells, so I asked him:

L: Now one thing I haven't heard you say anything about is about how they physically move the bell. Is it the motion as long as they, they get the ring out, is the motion unimportant or just less important?

B: Initially, when someone comes into the group, we spend about a week on how to ring the bell. I used to spend much more time on how to ring a bell and found that in, in the end result, they're gonna ring it like they're gonna ring it. I mean, I used to go through all this, I had like five steps to ringing a bell. You know, uh, making the circular motion and, and for a whole note, it was slower than for a half note and following through, and the whole ball of wax and we would get through all that and they would finally do it. And then we'd put it in the context of the song and as they would play the song, they developed their own individuality. So that's why I started saying, "Well, the heck with trying to do it that way, I'm never gonna balance a song like that because they're having enough to remember as it is. Let me go back and adjust the bells, so that the bells are kind of characteristic or individualized for ringing uh, the, the different ringing styles within, within the group. To get at least a uniformity there.

As part of his instructional guidance of the ringers, Brian planned how he would assign bells, and adjusted the bells to suit the individual ringer. Thus, he did not see the physical movement that the

ringers needed to make as salient. By doing such adjustments, he also lightened the cognitive task for the ringers and enabled them to focus more on learning the chords of a piece.

Molly, Handbell Ringer

Molly was an attractive woman, with a dignified manner, in her early forties. She was one of the original handbell ringers in the group and so has been a part of the group for thirteen years. Molly functioned as a spokesperson for the handbell ringers and was assertive about promoting the interests of the groups. She sang as well as played bells, and most recently had performed "Amazing Grace" as a duet with another bell choir member. I was able to speak quite a bit with Molly because I usually sat by her on the bus ride home each evening.

Molly played on the high Mi and the high Fi notes and the VI, VII, and III chords in the song "The First Noel." She was aware that because the group was practicing a song that was new, it would take extra practice to learn the piece:

L: Now how come he has to tell everybody how to play on that? How come people don't know already?

M: Because, uh, we have to, uh, adjust to that new song and we have to, uh, concentrate. And with a new song, sometimes it takes time before you really catch on to the song (Interview, December 18, 1992).

She also expressed an awareness that new pieces demanded that she concentrate more and pay attention to what chords she should play on. After the group practiced the piece for the third time, I asked if she thought the group was ready to perform the piece. Molly, after considering for a moment, said that she thought the group needed a bit more practice on the piece. Brian later told me that he, too, thought the piece needed a bit more work.

Molly had quite a bit of knowledge about the cues that Brian gives and was one of the ringers who rang on many of the important chords in the pieces that the group played. Since she had been in the choir since its inception, Molly probably had played over fifty pieces for handbells and learned an enormous number of chords that were specific to those pieces. She was aware that this was knowledge she had built up over time:

M: You have to be in a group for 13 years to really remember all of this stuff that Mr. Brian teaches because if you're in it but one year I'm pretty sure there's a lot of times that you have to go back and think and concentrate. Because he, he might do, he might do a song that you've tried already you know...and you have to remember when to play, when not to play. And when he goes to another song, a new song like that is more is, uh, you have to have your mind on it and concentrate on when you have to play and when you don't have to play. And we have to play on the chords and we have to stop the bells for the others to blend in their chords with your chords (December 18, 1992).

It was interesting that she consistently commented on the importance of "remembering chords" and damping the bells properly so that chords did not clash. Chords were the parts of the music that the ringers played differentially on, whereas the notes of the melody were always the same for the ringers.

Molly usually caught her own errors during practice. She would damp after a misring, or comment, "Oops," almost simultaneously as she rang. However, when I asked her during recall procedures why she misread certain cues she usually replied, "Just one of those mistakes." She understood that damping stopped the sound of the bells so that other chords did not "build" discordantly upon each other. She could point out when she played the melody in a piece and pointed out when misrings by other choir members did not "sound exactly" with her own bell.

Molly attributed the errors that Gordon, a new member of the group, made to his status as a new member of the group rather than to a lack of attention or effort. However, when I asked Molly about a problem another player, who had been in the group for several years, was having on his bells, Molly pointed out, "Well, you know, Sean likes to goof off a little bit. And it's not right, you got to pay

attention to your instructor" (December 18, 1992). Molly, as did all ringers, repeatedly talked about the need for attention and concentrating while playing a piece in our interviews.

Gina, Handbell Ringer

Like Molly, Gina had played in the handbell choir with Group 4 for 13 years. She relished telling me that the group had traveled to Colorado and the White House. Gina was a cheerful woman who enjoyed listening to country and western music on the radio. She had not had any other experiences in playing other instruments.

Gina played her bells when Brian gave two signs, the high Ri and the high Re. She played on the II, III, V, and VII chords. Gina stressed to me the importance of keeping her eyes on the director because, "If you move your eyes off the director, it's gonna mess up the whole song" (Interview, December 17, 1992). By this statement she seemed to be implying that her errors affected the group and consequently the song as a whole.

During the practice on December 16th, one of the ringers was absent and Gina commented about the absence:

G: Megan is not there, you see.

L: Does that cause problems when somebody's not there.

G: No, that don't cause no problems.

L: Does that mess up the song?

F: Nuh-uh, they just won't have the sound of her bells when she's not there (December 18, 1992).

Molly, in commenting about the same missing ringer, said that she thought that the absence did mess up the group a bit. Her perspective was similar to Brian, the director's, with regards to absences. An absent ringer changed the composition of the group, which affected how a piece could be played.

In part of the practice on December the 16th, Gina made an error during the practice. During the stimulated recall procedure, I asked her about it:

L: What happened there? You were supposed to be....

G: Oh, I was supposed to play on the five, but the way he was giving it, I thought it was a four.

L: Oh, I see, I see. But you caught yourself, huh?

G: Yeah. See it's kind of hard to see his, tell the way he gives the V, you see. That's why I thought it was a IV (December 18, 1992).

A problem that the ringers constantly had in the choir was that there were so many members they stretched across the cafeteria where practices were held. This made reading notes, and especially chords, challenging for the ringers. I found it interesting that Gina knew why she made the error in reading the signal Brian gave.

During the practice on December 16th, Brian asked the group to get chairs. He then had the group members stand up as he signaled their chords, in an attempt to reinforce when the ringers should play:

L: Now at this point he asked you guys to all go get a chair and to stand up on your chords, how come he did that?

F: We always usually do that.

L: You always usually do that.

F: Yeah.

L: How come? Do you know why?

F: To have more practice, too. That way we don't have to stay sitting, standing, as long.

L: Uh-huh, so it helps you sit down?

F: Uh-huh.

L: So is there any other reason why you do it that way?

F: We usually stand up all the way through, but I guess he figures since we were practicing a little bit longer....

L: ...that would help, ok. Is it hard to play that way, standing up and sitting down?

F: About the same.

L: It's about the same. Do you think it helps you play better?

F: It's better standing up.

L: It is better standing up?

F: Uh-huh, because when we go play for some other people, we won't get to sit down. Like say if we go out into the community to play for somebody else we won't get to sit down, we're going to have to stand up. And if you sit down they're going to think you want to sit down all the time to play the bells.

While I believe Gina misunderstood to some extent the reason why Brian was having the group go through this activity, she did have some sense of the importance of practicing a piece under circumstances as similar as possible to those in which she would be performing. Situating the practice was seen by Brian as being an instructional strategy that aided the ringers in remembering their parts of a piece.

Summary of Group 4

In Group 4, both the director and the ringers had to memorize material in order to perform. Brian, in order to more closely monitor the group, had to learn a large number of chords and to pair these chords with their accompanying signs. The ringers in the choir had to ring in response to specific chords at the appropriate times in a musical piece. However, whereas Brian had to recall all of the chords in a piece, the ringers had to distinguish only the chords in which they rang. The skills of both director and ringers combined to enable the group to perform pieces that were complex musically. The performance of these pieces, as in the other choirs, seemed to be the product of the choir as a whole, rather than the additive result of individual skills.

As did the other directors, Brian situated the practices that the group had, endeavoring to structure them similarly to the performances for which the group was preparing. Chords were learned within the context of a particular song and were not taught separately before the practice took place. Brian directed the group as a whole, stopping to instruct an individual ringer only after he or she had made several errors. Much of the individual modifications that Brian made occurred before practices took place. He decided before presenting a new piece which ringer would receive which bell and how, if necessary, to adjust the springs in the bells to compensate for how each individual ringer rang their bell. Because new ringers learned their parts alongside of the other ringers, they could model their behavior after other ringers in the group.

Brian was concerned that the music performed by the group communicated with the audience. Pieces were selected for their familiarity to the audience and their emotional value. Members of the choir expressed satisfaction with their level of performance, as did the director. Public performances were attended heavily by members of the community and the group was invited to give a wide variety of performances.

The Central Phenomenon

Strauss and Corbin (1990) define a central phenomenon as being "The central idea, event, happening, incident about which a set of actions or interactions are directed at managing, handling, or to which the set of actions is related" (p. 96). Thus, a central phenomenon can be seen as the organizing theme around which qualitative data are arranged. While the choice of a central phenomenon cannot escape being shaped by the theoretical orientation of the investigator, it is essential that it be grounded in the data collected and analyzed by the researcher. Consequentially, the phenomenon that emerges from a set of data may, and often does, differ from what the researcher might have expected to find before conducting the study.

The expertise exhibited by these groups did not appear to be solely dependent upon the skill level of the individual ringer, but rather it was a synergistic combination of the director's efforts and abilities, the instructional/directional method employed, and the proficiency of the ringers. I have chosen to term this phenomenon *socially shared expertise*. Constant reference was made, in interviews,

stimulated recall procedures, and casual conversations, by all participants, to how their performance was intimately integrated with and dependent upon the collaborative efforts of others in the group. Directors, jointly with the performers in these groups, contributed to the production of music. Cognition in these groups took on a social nature that was not constrained within the minds of individual participants. It was also the case, however, that skill and knowledge were not equally shared by all participants within the groups; some handbell ringers were more proficient and expressed more declarative knowledge of what was involved in making music with handbells than others. It was the additive, collaborative effects of each participant within the context of the choir that resulted in a high level of performance. Thus, the "expertise" in this study took on a different nature than that studied by traditional theorists in this field, who have studied expertise as an individually-bounded, non-social, problem-solving phenomenon.

The task of handbell ringing was one that required group collaboration. However, it was the sharing of the responsibility for the task that allowed the individuals with mental retardation to succeed at the task. Although there have been few studies of ensemble performance in the domain of music, it seems that the nature of an ensemble task would engender a definite social component. Two characteristics separate what Resnick (1991) refers to as socially shared cognition from what I am calling socially shared expertise. First, socially shared expertise denotes a high level of performance. Groups that display this expertise are perceived by others as possessing special knowledge and skill. In this aspect, socially shared expertise can be seen as a special case of socially shared cognition. Secondly, socially shared expertise incorporates the characteristics of what is traditionally referred to as expertise (see Glaser and Chi, 1988) but this expertise exists at the group, rather than at the individual level. Therefore, it is not necessary that every individual in the group exhibit all of the characteristics of expert cognition, but it is necessary that the group as a whole exhibit all of the characteristics of expert cognition. For example, it could be the case that one member of an ensemble group may not have the ability to self-monitor his or her own behavior but if another individual in the group took on the monitoring of this individual's performance, the group could still be classified as expert. This differs from traditional classification of expertise wherein the characteristics of expert cognition are manifested at the individual level.

A Model of Socially Shared Expertise

The categories arising from the data were grouped around the central phenomena of socially shared expertise (see Figure 1). This phenomenon unites the categories that came out of the data. Connections were determined between the previously described categories through axial coding. These categories were related to the core phenomenon of socially shared expertise and analytically ordered as suggested by Strauss and Corbin (1990). The model in Figure 1 illustrates the results of this process and is a framework for how socially shared expertise is exhibited in these groups. This model is grounded in the data collected in this study. As such, it should not be confused with a model generated from theory, which may be modified given new knowledge and theory. Rather, each part of this model has been generated from categorized and analyzed data.

The following analytical story line is an explanation of how the categories that emerged from the data are interrelated and grouped around the central phenomenon of socially shared expertise:

In order to produce sound from a handbell, ringers had to use certain physical movements. The movements needed to produce the optimum sound from the bells occurred both on a local level, where the ringer had to monitor his or her movements of the bells that were held in the hands, and on a more generalized level, where ringers with more than one bell had to plan and monitor the moves needed to pick up various bells. The physical movements required while ringing varied given the pieces that were being played. Ringers had to focus their attention either on the music or on the director's cues so that they knew when to make these physical movements. Attention had to be of high intensity so that ringers would not miss reading a note, because this would affect the output of the group's music as a whole. Attention also had to last for the length of a piece of music or, again, the ringers would not know when to produce the appropriate physical movements. If any of the group members failed to pay attention while playing a piece, the overall quality of the piece was lessened. Timing was the third

condition necessary to produce the shared output. Not only did the physical movements have to be produced promptly at the proper time in the music, they had to be synchronized with the movements that other ringers in the same chord were making. They also had to occur within the context of the tempo of the piece. Tempo setting and changing were monitored by the director but a result the attention the ringers paid to the director's cues or the notation in the music. Physical movements, attention, and timing were the causal conditions for socially shared expertise within the context of these handbell choirs.

There were intervening variables that constrained or enhanced the amount or form of the expertise in the groups. None of the groups had an extended amount of time for practice, but they used the practice time to learn specific pieces of music that would be performed. Ringers had different levels of expertness that affected the overall expertise of the group. Some had physical limitations that affected how they rang their bells. Others were more knowledgeable or accurate in reading the music, whether from a score or the hands of the director. The expertise of the director, that was a result of his or her level of musical knowledge and pedagogical knowledge, affected the way the group came together to produce music. The difficulty of a piece of music was a variable that subsequently affected the strategies used to produce a piece and consequently shaped the quality of the music performed by the group.

A number of strategies were used by the groups to enhance the socially shared expertise of the group. The primary strategy used by the groups was that of distributing the cognitive load. All members took on part of the responsibility for the shared responsibility. Part of the load was also distributed upon the directional method used in the groups. Scaffolding in the forms of planning and monitoring were used by the groups to maintain a certain level of competency in their music making. This planning and monitoring was also differentially distributed among ringers and directors across the groups. Practice was situated so that the necessary conditions for producing music were learned within the context of a musical piece. Models of appropriate bell ringing were available to novices because they practiced music along side of more experienced bell ringers and this also helped scaffold performance.

The consequences of the interaction of these strategies with the intervening variables upon the phenomenon were that the quality of the music, namely its complexity and the tempo in which it was played, varied. Directors and ringers based their satisfaction with a piece on how these factors came together to affect the group's music making. Finally, the number and variety of performances that a group was invited to was dependent upon the effects of these variables upon the overall group expertise.

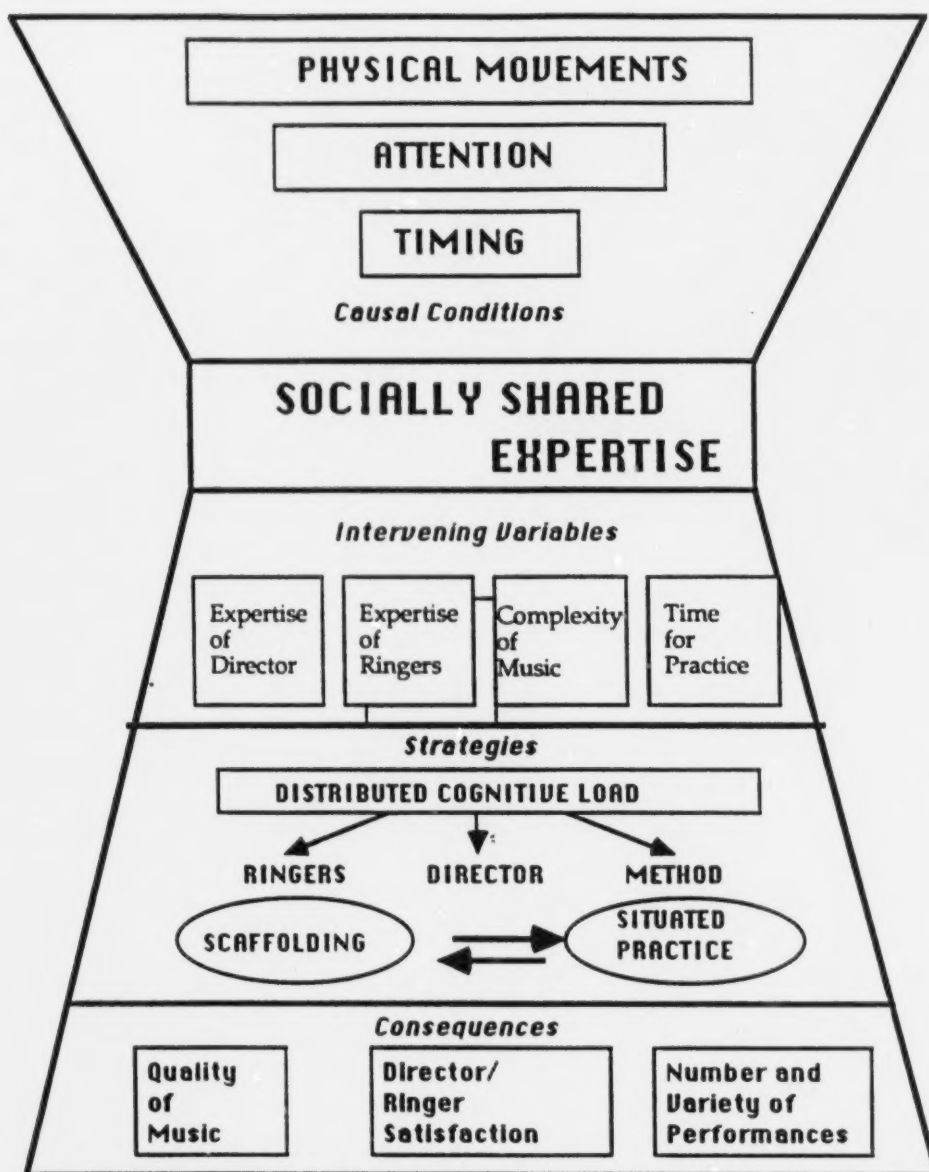


Figure 1: A model of socially shared expertise within the context of music making in handbell choirs.

Discussion

Kuhn (1970) pointed out that paradigms in scientific communities allow for the common conception of relevant research questions, methodologies, and for the codification of scientific commentary. However, scientific paradigms may also limit our examination of certain phenomena and the way in which we ask questions about them. Expertise has become a popular construct for researchers within the cognitive science community. Ericsson and Smith (1991) point out that because of the popularity of this concept, many investigators have simply used the term "expertise" without exploring explicitly what the term encompassed. I want to contend that the term "expertise," even as employed in its original conceptualization (e.g., Chase & Simon, 1973; Chi, et al., 1981; deGroot, 1965; Glaser & Chi, 1988) incorporates components that are not purely cognitive in nature. These components became especially salient when investigating how the concept of expertise could be applied to individuals with mental retardation.

Defining Expertise

Investigators in cognitive psychology have defined expertise by: (a) demonstrations of skill at an agreed upon criterion within that domain (e.g., Chase & Simon, 1973; deGroot, 1965; Larkin, McDermott, Simon, & Simon, 1988), (b) levels of performance, professional status, or experience level as compared to that of the novice (e.g., Chi, et al., 1981; de Jong & Ferguson-Hessler, 1986; Groen & Patel, 1988; Lawrence, 1988), (c) membership in a particular, usually professional group (e.g., Dawson, et al., 1989; Johnson, 1988; Larkin, 1983; Lawrence, 1988), (d) perceptions by others of a performance (Lesgold, et al.; Tanaka & Taylor, 1991), and (e) amount of experience within a domain (e.g., Means & Voss, 1985; Simon & Simon, 1978). In each of these definitional schemes, social aspects enter into the cognitive construct of expertise. I am not arguing that expertise is a wholly chimerical phenomenon, but I do wish to point out how the social is part of what we consider to be primarily cognitive.

The social component of expertise becomes particularly salient when examining a sample wherein the population (such as those with mental retardation) deviates culturally and intellectually from those typically used in studies on expertise. Sternberg and Frensch (1992), in their discussion of expertise, give the example of a medicine man in what might be considered a primitive tribe. Members of the tribe regard the medicine man as an expert but we, in our culture, would be reluctant to consider him, given our own standards of medical care, an expert. However, the medicine man undoubtedly has a large amount of domain-specific knowledge, has automatized procedures for dealing with medical emergencies, and other cognitive characteristics of an expert. Sternberg and Frensch conclude "...expertise is, in large part, an attribution. A person is an expert because she is regarded as such by others" (1992, p. 194).

I would also like to assert that the conceptualization of expertise as a construct that can encompass *group* performance as well as individual performance fruitfully expands the construct of expertise. Much of what we accomplish is the product of human collaboration, of an interplay among skill level, ideas, and resources. If we consider a group as an entity then the cognitive attributes of expertise could be investigated in the group as a whole, rather than in each of the individual members of that group and the group could be seen as expert. In such a fashion, expertise would be something that the group shared, rather than something that each member of the group would have to display. Conceptually then, all the members of the group might not possess all of the cognitive components of expertise in a domain, but the group itself would be a collective of these attributes. Such a conceptualization would allow for the classification of those with less ability, such as individuals with mental retardation, as expert. While it may be that individually classifying an individual with mental retardation as expert is not possible, classifying a group with mental retardation as expert might be possible.

Expertise as Socially Shared Cognition

Expertise has traditionally been discussed as cognition that occurs within individuals. Recently, some researchers (e.g., Lave & Wenger, 1991; Resnick, 1991; Rogoff, 1991) have asserted that cognition may be socially shared, that it may take on a social nature that is not bounded by the limits

of individual cognition. Instudea, conition is the product of social interactions, of acquired cultural knowledge, and of language. As such, cognition is seen as always highly social in nature.

The first question in this study was, "How might the construct of 'expertise' be applied to demonstration of skill and competencies in the domain of music by individuals with mental retardation?" In the groups observed, constant reference was made, in interviews, stimulated recalls and casual conversation, by all participants, to how their performance was intimately integrated with and dependent upon the collaborative efforts of those in the group. Directors of the groups were thought of and participated as part of the handbell choirs and, together with the ringers, contributed to the production of music. The method of direction that the director used and the written music that was used by the groups were tools that aided and guided the activity. Even the quality of an individual ringer's contribution was constrained by contextual features outside of the individual ringer, such as the types of cues given by the director or the time spent on practicing a piece. It was appropriate, therefore, to treat the groups, rather than the individual members of the groups, as the primary unit of social and cognitive analysis. Because handbell ringing is a group activity, it may be that the social nature of the domain itself contributed greatly to the appearance of shared expertise in these groups. This is not to suggest that all expertise is shared in this manner, but it may be particularly the case when a group is responsible for a product.

If expertise is examined as a phenomenon that may be socially shared, that may be possessed by a group as well as by an individual, then a question arises about what cognitive attributions socially shared expertise holds in common with the traditional findings on expertise. Certainly the groups possessed domain knowledge that those who are not in handbell groups do not have. This knowledge was sufficiently organized so that directors and ringers could explain the essential elements of handbell ringing, what were the properties of superior performance, and how problems could be remediated. Certain aspects of both the directors' and the ringers' tasks were automatized, which freed up cognitive resources so that attention could be paid to reading music and responding to the director's cues. Ringers had to remember their notes and the corresponding cues for them. Directors had to remember tempo and dynamics of pieces. There was a strong monitoring system in place in all the groups. Directors were responsible for hearing the overall musical output of the group and making suggestions accordingly. Individual ringers remembered when directors pointed out their errors and took steps to correct them. These characteristics of the groups appear to intersect with those listed by reviews of the research on expertise (e.g., Glaser & Chi, 1988; Ericsson & Smith, 1991). The difference in the conception of socially shared expertise lies in that not all of the individuals in the groups exhibit these characteristics, but each group *as a whole* exhibits these characteristics. In order to use the term expertise to evaluate the groups cognitively, it should be the case if some of these functions do not appear in an individual ringer, we should be able to find the function appearing somewhere else within the group, for example, in the director. In such a manner, socially shared expertise was assisted by the distribution of the cognitive load.

Distributing the Cognitive Load

The concept of distributed labor is a traditional area of interest to cultural anthropologists. In the handbell choirs in this study, music-making was an activity in which ringers, directors, and the directional method shared the cognitive load required in performing a piece of music. Cole (1991) pointed out that in "the notion of *sharing cognition* is that sharing often means both 'having in common' and 'dividing up' at the same time" (p. 398). In the handbell choirs in this study, the group members shared the common goal of learning a piece of music. The cognitive tasks within the context of music-making were distributed among the group members.

The idea that cognition may be socially distributed has been found in real world examples, particularly in that research conducted within the workplace (e.g., Hastie & Pennington, 1991; Lave & Wenger, 1991; Scribner, 1984). In these circumstances, not all individuals within the organization share the same knowledge. The activities of the group do not even necessitate that all members of the group be present at the same time. However, the accomplishment of the group's goals is made possible by the different contributions of individuals in the group. Another analogy that may be used is that of team

sports. While one offensive player on a football team may be superior, it is also the contributions of the other offensive players, the defense team, and the coach (who in actuality never even touches the football) that come together to win a game. Hutchins (1991) suggests that the organization of a group itself contributes to the cognitive qualities of a group. Differences in two teams, therefore, could depend on differences in how the teams are organized, who is put in as first-string quarterback, for example, in addition to the properties of the individuals on the two teams.

I believe that partly because handbell playing was an activity that could be shared among the group members, the groups with mental retardation were able to achieve the high level of competence that they did. Perhaps one of the reasons that individuals with mental retardation are considered to be generally less competent is that we assess their capabilities on the basis of their individual abilities, rather than their capabilities within an assisted or group structure. This concept is reminiscent of the argument that Salomon, Perkins, and Globerson (1991) advanced in their discussion of how computers might support cognitive processes in assuming a large part of processing that otherwise would have to be regulated by the person. Assessment of ability then is directed at the joint partnership of person and machine, rather than of individual performance.

If we can conceive of cognition as being socially shared, it is a logical conclusion that expertise may also, under some circumstances, be socially shared. Competency could be seen as distributed among the members of the group, and synergistically, comes together to produce group expertise. The difference for groups with people with retardation lies in how much of the cognitive load these individuals take on versus the load adopted by a person without mental retardation. In Groups 2 and 3 in this study, for example, the directors took on much of the cognitive load in the form of memorization of a piece, planning, and monitoring. Other aspects, for example, the tempo in which a piece is played, are the responsibility of the directors across all of the groups, both those with retarded members, and those whose members were not retarded.

Situated Practice

Theories of situated cognition (e.g., Brown, Collins, & Duguid, 1989; Greeno, 1990; Lave, 1988; Lave & Wenger, 1991; Resnick, 1991; Suchman, 1987) assert that the social and physical context in which cognition takes place is an integral part of the cognition that occurs. Cognition is not a decontextualized, stable phenomenon. It is a response to, a product of, and an agent in a given situation. In this tradition, Lave (1991) described learning not as the individual internalization of information from the environmental milieu, but as "a process of becoming a member of a sustained community of practice" (p. 65).

The concept of situated cognition does much to reframe conceptually the activity of handbell ringing in this study. Learning techniques and the signs for new notes continually took place within the context of learning a new piece of music. Inexperienced and novice ringers learned along side those who were more experienced, eventually acquiring new bells or being assigned bells that were more active during a piece. Ringers were part of a community activity practicing a craft.

Transfer of skills by individuals with normal intelligence is rare in the research literature, and almost nonexistent in individuals with mental retardation. The handbell ringers in this study, however, did apply their skills across different pieces of music. The theory of situated cognition attributes the lack of transfer found in laboratory settings to the idea that all learning is situated. The problem with this view is then that there is no such thing as general knowledge that may be applied across situations. Brian, the director of Group 2, repeatedly pointed out that the ringers learned their cues within the context of a piece. However, he explained that transfer of knowledge of the cues learned occurred because the ringers has seen the cues before in several other similar musical pieces. In this way, reading the correct musical cues is both situated, yet seen as a transferrable tool that can then be applied to similar musical contexts.

The knowledge of experts can also be seen as situated. Experts are experts within their own domain of expertise. They are not experts in any general sense. They have developed strategies and memory that apply particularly in a given domain. These skills have been developed by their practice and immersion in a given area.

Scaffolding

Scaffolding took place in the groups in two circumstances. First, directors planned how they would direct their groups, which ringers would be assigned which bells, and the music the group would play. Planning was particularly in evidence in the groups with mental retardation. These directors anticipated difficulties their ringers would have in producing a piece together and took steps to support performance in their groups.

Scaffolding particularly took place in the modeling and monitoring directors gave to individual ringers who encountered difficulties. They would stop the practice, provide instruction, and attempt to problem solve with the ringers. It is interesting that scaffolding was not as evident between the director and the group as a whole, but took place either before the practice or on an individual basis.

I believe that expertise could also be conceptualized as being scaffolded by means of an expert working in collaboration with a non-expert. Again, in viewing expertise in this manner, the dyad's expertise would have to be assessed collectively, rather than in each individual.

The construct of *socially shared expertise* can be used to describe demonstrations of skill and competencies in groups of individuals with mental retardation. The synergistic combination of director, ringers, and directional methodology in these groups produced music that was socially esteemed, comparatively skillful, and occasionally financially compensated. In addition, many of the components of traditional cognitive expertise were evident in the group as a whole.

Expertise in Individuals with Mental Retardation

The second question that guided this study was, "In what ways was the expertise exhibited by individuals with mental retardation similar to or different from the manifestation of expertise in non-retarded populations?" Again, in this study, it was more appropriate to analyze the overall functioning of the groups, rather than that of individual members of the groups. The reformulated question became, "In what ways is the socially shared expertise exhibited by individuals with mental retardation similar to or different from the manifestation of socially shared expertise in non-retarded populations?"

The model in Figure 1 was built from the input of all five groups, not only from individuals with mental retardation. What is different about the groups with mental retardation is not the categories within the model, but the interrelation of those categories and the placement of the characteristics of each group on the dimensions within each category. The most striking category in which these differences appear is in that of distributed cognitive load. The directors of the groups with mental retardation assumed more of the load than did Sam, the director of the group without mental retardation, or Cathy, the director of my own handbell choir. Elaine, the director of Group 1, who had less musical knowledge than the other directors, distributed much of the cognitive load for her as director, onto the directional method she used. The method, although it required much planning and initial effort, freed her to focus on her directing and monitoring of the group's progress through a song. The directors of all of the choirs with mental retardation looked for ways in which they could assume more of the cognitive responsibility for the music being produced. By doing so, they prevented the ringers from overextending their ability to attend and they could then process the music that they were reading. One consequence of taking on more of the responsibility for the activity was that the music produced was simpler and in some cases, slower, than that produced by the ringers without mental retardation. However, this consequence was also one of using the directional methods that they employed; even the most sophisticated of the techniques, used by Group 4, had limitations. For example, the method was difficult to use to direct two melody lines.

The second most salient difference was in the amount of self-monitoring the groups with mental retardation engaged in as opposed to that in those without mental retardation. Monitoring in groups with mental retardation was predominantly other-directed, namely, the director tended to monitor the ringers. As part of the monitoring procedure, directors of the groups with mental retardation were also the primary evaluator of a group's output. The ringers with mental retardation based their

evaluations of the quality of music they were producing on the reactions of others. A consequence of this outer-directedness was that ringers with mental retardation, who always received expressive and positive feedback from audiences, were always highly satisfied by the quality of music they performed.

The third category in which differences between the two groups appeared is in that of attention, specifically along the dimension of focus of attention. Those with mental retardation focused their attention on cues given by the directors. Those without mental retardation hardly seemed to look at the director at all. They focused on the music in front of them. Because the focus was on the director in the groups with mental retardation, the director could then use the strategy of monitoring and, if necessary, modifying the ringing that was taken place more easily. These directors could also more easily catch attention that was drifting. In the group without mental retardation, Sam did not have as much direct control over attention.

Finally, planning was different for the directors of the groups with mental retardation. They had to choose their music carefully, being cognizant of the overall ability of their ringers and the maximum tempo at which the group could play, and transform the music so that it was compatible with their method of direction. This is not to suggest that Sam's planning was trivial, only that he did not need to examine as many variables as did the other directors.

Conversely, the groups were similar in their identification of the skills that were necessary in order to produce music. The category of attention was very salient for the participants in both the groups with mental retardation and the group without mental retardation. As noted previously, one of the characteristics of learning in individuals with mental retardation is limited attentional capacity. Nugent and Mosley (1987) have noted that differences between groups of individuals with and without retardation are particularly marked when the load on information processing is increased. In the participants with mental retardation in this study, attention seemed to be strongly focused on the director and was sustained throughout the length of the pieces that the groups played. It seems that, because the directors were able to successfully take on more of the cognitive load of the ringing task, the ringers were able to attend to the director's directing and the task of ringing the bells.

Timing and the physical movement necessary to ring the bells were issues for all of the groups. However, in the groups with mental retardation, the directors employed conducting methods that placed more of the cognitive load upon themselves, and scaffolded the physical movements of some of the more physically impaired ringers. Because the focus of attention of the ringers was on the director, or, in the case of Group 1, on the chart, the director was able to monitor the timing of the rings in the group. In Group 5, the ringers looked at their music and counted out the measures on their own, but still relied on Sam for tempo changes. The physical movement required to ring a single bell was not often an issue for the members in Group 5, but when the number of bells being rung was great, as was in the case of Charles, how to physically pick up and put down the bells became significant. Thus, despite the differences in cognitive abilities, all five groups identified the necessity of focused attention, correct physical movements, and precise timing in producing music.

The groups with mental retardation were also similar to the group without mental retardation in the variables that constrained or enhanced the performances. The individual expertise of the ringers, the expertise of the director, the complexity of the music performed, and the time the group was able to practice a piece, all affected the final performance of a musical piece. The extent to which these categories varied and the strategies implemented to deal with deficiencies in these categories determined the proficiency with which a group performed.

Differences between the groups with mental retardation and the group without mental retardation could be seen in the interrelation of the categories with each other and the variability of the skill displayed within each category. The similarity among the groups was that the categories were the same across all of the groups, and the causal conditions for producing music were the same.

Implications for Future Research

Two aspects of this study seem to have implications for future research. First, the idea that the construct of expertise may be applied not only to individual, but to group performance, seems to be a

theoretical contribution to the research literature. I have suggested that in a group situation it may not be necessary that all members of the group possess all of the cognitive features of expertise, as long as these features are exhibited by the group as a whole, and that someone in the group takes on such responsibilities as monitoring and problem representation. Again, I am not suggesting that all expertise is shared, but it certainly was the case in this study and, I presume, manifests itself similarly within other domains. Investigation of shared expertise in other domains seems to be a provocative and potentially fruitful area of study.

Secondly, this study seems to have implications regarding the instruction of individuals with mental retardation. In the groups observed, individuals with mental retardation were able to sustain attention, perform consistently in a group situation, and transfer the skills that they had learned while practicing one piece of music to another piece of music. Their ability to perform at a relatively high level had much to do with the nature of the task being one that they could share, rather than one for which they were solely responsible. The directors were able to distribute the cognitive load, scaffold learning, and situate the learning so that these individuals were able to participate successfully in the activity. Given previously noted difficulties in transferring learning noted in this population, the methods these directors used merit consideration by educators. Perhaps allowing individuals with mental retardation to engage in what Lave and Wenger (1991) term *legitimate peripheral participation*, can facilitate learning and transfer in a manner that traditional instructional methods do not.

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